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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. § 1.53(b))

Attorney Docket No.	RCA 90,316
First Inventor or Application Identifier	Schröder
Title	Voice Control System with ...
Express Mail Label No.	EL675421365US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: Assistant Commissioner for Patents
Box Patent Application
Washington, DC 20231

1. [X] * Fee Transmittal Form *(e.g., PTO/SB/17)*
(Submit an original and a duplicate for fee processing)

2. [X] Specification [Total Pages 7]
(preferred arrangement set forth below)
- Descriptive title of the Invention
- Cross References to Related Applications
- Statement Regarding Fed sponsored R & D
- Reference to Microfiche Appendix
- Background of the Invention
- Brief Summary of the Invention
- Brief Description of the Drawings *(if filed)*
- Detailed Description
- Claim(s)
- Abstract of the Disclosure

3. [X] Drawing(s) *(35 U.S.C. 113)* [Total Sheets 1]

4. Oath or Declaration [Total Pages]
a. [X] Newly executed (original or copy)
b. [ ] Copy from a prior application (37 C.F.R. § 1.63(d))
(for continuation/divisional with Box 16 completed)
i. [ ] DELETION OF INVENTOR(S)
Signed statement attached deleting inventor(s) named in the prior application, see 37 C.F.R. §§ 1.63(d)(2) and 1.33(b).

** NOTE FOR ITEMS 1 & 13: IN ORDER TO BE ENTITLED TO PAY SMALL ENTITY FEES, A SMALL ENTITY STATEMENT IS REQUIRED (37 C.F.R. § 1.27), EXCEPT IF ONE FILED IN A PRIOR APPLICATION IS RELIED UPON (37 C.F.R. § 1.28).*

5. [ ] Microfiche Computer Program *(Appendix)*

6. Nucleotide and/or Amino Acid Sequence Submission
(if applicable, all necessary)
a. [ ] Computer Readable Copy
b. [ ] Paper Copy (identical to computer copy)
c. [ ] Statement verifying identity of above copies

09/660381 PTO 09/12/00

ACCOMPANYING APPLICATION PARTS

7. [X] Assignment Papers (cover sheet & document(s))
8. [ ] 37 C.F.R.§3.73(b) Statement *(when there is an assignee)* [X] Power of Attorney
9. [ ] English Translation Document *(if applicable)*
10. [X] Information Disclosure Statement (IDS)/PTO-1449 [X] Copies of IDS Citations
11. [X] Preliminary Amendment
12. [X] Return Receipt Postcard (MPEP 503)
(Should be specifically itemized)
13. [ ] * Small Entity Statement(s) *(PTO/SB/09-12)* [ ] Statement filed in prior application, Status still proper and desired
14. [X] Certified Copy of Priority Document(s)
(if foreign priority is claimed)
15. [ ] Other: .....

16. **If a CONTINUING APPLICATION,** *check appropriate box, and supply the requisite information below and in a preliminary amendment:*
[ ] Continuation [ ] Divisional [ ] Continuation-in-part (CIP) of prior application No: ____/____
Prior application information: Examiner _____ Group / Art Unit: _____
For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 4b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

17. CORRESPONDENCE ADDRESS

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Name	JOSEPH S. TRIPOLI THOMSON multimedia Licensing Inc.				
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Name (Print/Type)	Kuniyuki Akiyama	Registration No. (Attorney/Agent)	43,314
Signature		Date	Sept. 12, 2000

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Ernst F. Schröder
Filed: Herewith
For: VOICE CONTROL SYSTEM WITH A MICROPHONE ARRAY

PRELIMINARY AMENDMENT

Hon. Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination and calculation of fees, please enter the following Preliminary Amendment and the accompanying remarks.

In the Claims

Please amend the claims as follows:

1. (Amended) Voice control system with a microphone array comprising a plurality of microphones for converting voice commands into electrical signals, and with a central speech recognition unit for converting these electrical signals into operational commands, [**characterized** in that] wherein the microphones are distributed between different appliances which are connected to one another in such a way that the signals generated by the microphones can be transmitted to the central speech recognition unit.

2. (Amended) System according to Claim 1, [**characterized** in that] wherein the appliances are connected via a bidirectional network.

3. (Amended) System according to Claim 2, [**characterized** in that] wherein the bidirectional network is based on an IEEE 1394 bus.

4. (Amended) System according to Claim 1, [**characterized** in that] wherein one or more microphones are integrated in a consumer electronics reproduction appliance, in particular television set, and one or more further microphones are integrated in external loudspeakers.

REMARKS

Claims 1-4 are pending. The claims 1-4 have been amended to correct informalities and to conform to U.S. practice. No new matter has been added.

No fee is believed due in regard to the present amendment. However, if a fee is due, please charge the fee to Deposit Account 07-0832.

Respectfully submitted,
Ernst F. Schröder

By _____
Kuniyuki Akiyama, Agent
Registration No. 43,314

Date September 12, 2000

THOMSON multimedia Licensing Inc.
Patent Operations
Two Independence Way, P.O. Box 2023
Princeton, NJ 08540

Voice control system with a microphone array

FIELD OF THE INVENTION

The invention relates to a voice control system with a microphone array which can be utilized in particular for controlling apparatuses appertaining to consumer electronics.

BACKGROUND OF THE INVENTION

Voice control systems are used in a multiplicity of technical fields. In this case, the spoken words are firstly detected as sound signals, usually by one or more microphones, and are then fed to a speech recognition system. In this case, the speech recognition is usually based on an acoustic model and a speech model. The acoustic model utilizes a large number of speech patterns, mathematic algorithms being used to indicate the words which acoustically best match a spoken word. The speech model in turn is based on an analysis which uses a multiplicity of document samples to ascertain the context in which, and how often, certain words are normally used. Such speech recognition systems make it possible to recognize not only individual words but also fluently spoken sentences with high recognition rates. However, the recognition rate drops drastically when non-negligible background noises are present.

The robustness with respect to such acoustic interfering influences can be increased in various ways. Thus, in dictation systems for computers, a microphone on a headset frame is fastened directly in front of the speaker's mouth. In these systems, a very constant signal and hence an, in some instances, appreciable recognition rate can be achieved only by the direct proximity to the mouth. It is likewise known to control a television set by speaking the operational commands into the microphone which is integrated in a

remote control. However, the remote control has to be held directly in front of the user's mouth in this case as well.

SUMMARY OF THE INVENTION

The invention is based on the object of specifying a voice control system which enables sufficient interference immunity even in the event of voice input from a relatively great distance. This object is achieved by means of the apparatus specified in Claim 1.

In order to enable voice control even from a relatively great distance, the voice signal must be separated from interfering background signals. This can be effected by spatial separation using microphone arrays comprising two or more microphones. In this case, it is advantageous for the individual microphones of the microphone array to be distributed spatially over the greatest possible distance. In an individual consumer electronics appliance, however, the distances between the individual microphones are limited on account of the dimensions of the appliance, such as e.g. to less than one metre in the case of a television set.

In principle, the voice control system according to the invention comprises a microphone array having a plurality of microphones for converting voice commands into electrical signals and a central speech recognition unit for converting these electrical signals into operational commands, the microphones being distributed between different appliances which are connected to one another in such a way that the signals generated by the microphones can be transmitted to the central speech recognition unit.

In this case, the appliances are advantageously connected via a bidirectional network, which is particularly advantageously based on an IEEE 1394 bus.

The system is particularly advantageous if one or more microphones are integrated in a consumer electronics reproduction appliance, in particular a television set, and one or more further microphones are integrated in external loudspeakers.

BRIEF DESCRIPTION OF THE DRAWINGS

An exemplary embodiment of the invention is described with reference to the drawing.

The drawing shows an arrangement according to the invention for voice control with a microphone array.

DETAILED DESCRIPTION OF PREFERED EMBODIMENTS

Fig. 1 schematically illustrates a system according to the invention. Two external loudspeakers LS1, LS2 are connected to a television set TV. Internal loudspeakers (not illustrated in the figure) of the television set enable, together with the external loudspeakers, a surround sound reproduction of multi-channel audio signals, e.g. the reproduction of corresponding digital audio signals according to the MPEG 2 or AC3 standard. In this case, the external loudspeakers are connected via an IEEE 1394 bus, also called FireWire, directly to the television set, but could equally be connected to a suitable surround sound receiver. The use of an IEEE 1394 bus is advantageous since the latter enables fast data transmission and communication between different appliances. Furthermore, in the case of active loudspeakers, power can be supplied via this bus at the same time.

For the detection of the voice signals, a microphone array is provided. The latter comprises two microphones MTV1 and MTV2 - integrated in the television receiver - and a respective microphone MLS1 and MLS2 integrated in the loudspeaker housings. These microphones convert the detected sound signals into

electrical signals which are amplified by amplifiers, converted into digital signals by AD converters and are then fed to a signal processing unit. In this case, the signals from the external loudspeakers are likewise fed via the IEEE 1394 bus to the signal processing unit in the television set. The said signal processing unit takes account of the respective whereabouts of the user by different scaling or processing of the detected sound signals. Furthermore, the microphone signals can also be corrected with regard to the sound signals output by the loudspeakers. The signal processed in this way is then fed to a speech recognition unit, which converts the electrical signals into words. Finally, the commands corresponding to these words are then fed to a system manager for controlling the system.

The scaling or processing of the detected sound signals by the signal processing unit requires the spatial arrangement of the microphones to be known. This is already known by the manufacturer for the microphones which are integrated in the TV housing. For the microphones which are arranged in the loudspeakers, by contrast, the position relative to the TV set must still be determined. This can be done by measurement and inputting of the values determined via a corresponding screen menu. However, a measurement and calibration operation may likewise be carried out by a test signal tone being reproduced by the loudspeakers and detected by the microphones and the position of the microphones being determined from the different propagation delays.

The two microphones integrated in the television receiver may advantageously be accommodated on the left-hand and right-hand sides of the housing of the respective appliance. However, this number of microphones and likewise the number of further microphones are in no way restricted to two. A

multiplicity of combinations in which the microphones are integrated are likewise conceivable. Thus, instead of or in addition to the television set, microphones may also be integrated in a video recorder, DVD player or a remote control. It is even possible to install microphones in appliances which are situated in different rooms.

Furthermore, the connection of the appliances is not restricted to a bus system. Thus, it is conceivable, for example, for the loudspeakers in the embodiment from Figure 1 to be driven by radio signals instead. In this case, however, the individual loudspeakers must also have a radio transmitter in addition to a radio receiver.

The invention can be used for the voice-activated remote control of a wide variety of appliances appertaining to consumer electronics, such as e.g. of TV sets, video recorders, DVD players, satellite receivers, TV/video combinations, audio devices or complete audio systems, but likewise of personal computers or of domestic appliances.

Patent claims

WHAT IS CLAIMED, IS

1. Voice control system with a microphone array comprising a plurality of microphones for converting voice commands into electrical signals, and with a central speech recognition unit for converting these electrical signals into operational commands, **characterized** in that the microphones are distributed between different appliances which are connected to one another in such a way that the signals generated by the microphones can be transmitted to the central speech recognition unit.

2. System according to Claim 1, **characterized** in that the appliances are connected via a bidirectional network.

3. System according to Claim 2, **characterized** in that the bidirectional network is based on an IEEE 1394 bus.

4. System according to Claim 1, **characterized** in that one or more microphones are integrated in a consumer electronics reproduction appliance, in particular television set, and one or more further microphones are integrated in external loudspeakers.

Abstract

Voice control systems are used in diverse technical fields. In this case, the spoken words are detected by one or more microphones and then fed to a speech recognition system. In order to enable voice control even from a relatively great distance, the voice signal must be separated from interfering background signals. This can be effected by spatial separation using microphone arrays comprising two or more microphones. In this case, it is advantageous for the individual microphones of the microphone array to be distributed spatially over the greatest possible distance. In an individual consumer electronics appliance, however, the distances between the individual microphones are limited on account of the dimensions of the appliance. Therefore, the voice control system according to the invention comprises a microphone array having a plurality of microphones which are distributed between different appliances, in which case the signals generated by the microphones can be transmitted to the central speech recognition unit, advantageously via a bidirectional network based on an IEEE 1394 bus.

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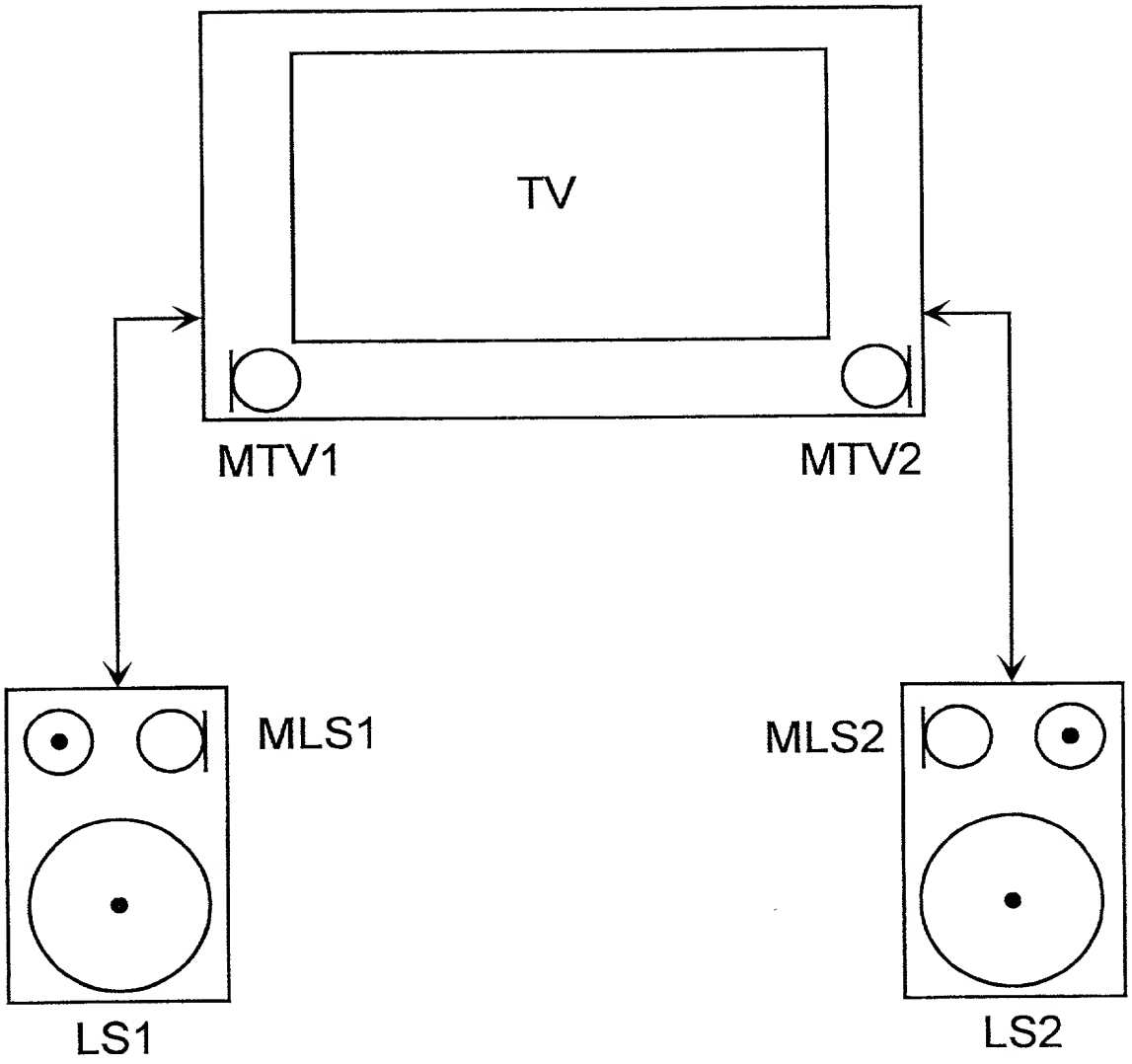

Fig. 1

PD990065

DECLARATION FOR UNITED STATES PATENT APPLICATION,
POWER OF ATTORNEY, DESIGNATION OF CORRESPONDENCE ADDRESS

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

VOICE CONTROL SYSTEM WITH A MICROPHONE ARRAY

the specification of which
(CHECK ONE) (xx) is attached hereto.
( ) was filed on , Application Serial. No.
and was amended on .

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 CFR 1.56(a).

I hereby claim foreign priority benefits under 35 USC 119 of any foreign application(s) for patent, utility model, design or inventor's certificate having a filing date before that of the application(s) on which priority is claimed:

Prior Foreign Application(s)			Priority Claimed	
Number	Country	Date Filed	Yes	No
199 43 875.7	DE	September 14, 1999	xx	

I hereby claim the benefit under 35 USC 120 of any US Application(s) listed below, and, insofar as the subject matter of each of the claims of this Application is not disclosed in the prior US application in the manner provided by the first paragraph of 35 USC 112, I acknowledge the duty to disclose information which is material to the examination of this application in accordance with 37 CFR 1.56(a).

Serial No.: Filed:

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under of 18 USC 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

I hereby appoint the following attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: Joseph S. Tripoli (Reg. No. 26,040), Eric Herrmann (Reg. No. 29,169) and Joseph J. Laks (Reg. No. 27,914) Telephone: (609) 734-9813.

Address all correspondence to Joseph S. Tripoli, Patent Operations - Thomson multimedia Licensing, Inc. - CN 5312 - Princeton, New Jersey 08543-0028.

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